Knowledge Sharing for Innovation Performance Improvement in Micro/SMEs: An insight from the creative sector

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As the economy becomes more reliant on innovative, knowledge-intensive firms, understanding the interaction between knowledge and improving innovation performance is increasingly important. Despite the majority of UK businesses being micro, small or medium-sized enterprises (micro/SMEs), knowledge management research has tended to focus on large companies, and the findings may not be applicable to micro/SMEs, especially in the creative sector. Moreover, the important role played by knowledge sharing in innovation can be critical to successful performance for smaller players in the creative sector where resources are limited.

Our study presents an insight from micro/SMEs operating in a highly knowledge-intensive and innovative creative industry - games/entertainment software development. Using a mixed method approach, we investigate knowledge sharing and its contribution to firm innovation performance improvements. Our findings suggest that micro/SMEs are at the forefront in the creative sector precisely because of their smaller size. Our study reveals evidence of knowledge donation but limited evidence of knowledge collection in the knowledge sharing process in micro/SMEs. We develop a knowledge sharing model for innovation performance improvement in micro/SMEs. This highlights the importance of industry context, individual knowledge and organisational size in the role of knowledge sharing in innovation performance.

Keywords: knowledge sharing, knowledge donation, innovation, micro/SMEs, innovation performance, creative industries

1. Introduction

The importance of SMEs to economic development and growth is acknowledged by policy makers, business leaders and scholars worldwide. In Europe and the UK in particular, SMEs account for two-thirds of total employment and represent 99% of business enterprises (Gray et al., 2012). The rapid developments in digital technologies are driving an unprecedented demand for knowledge-intensive services from knowledge-oriented industries. These industries include software, video/entertainment and computer games development and are gathered under the umbrella term, creative industries (UK DCMS 2006). These combine creative, industrial and service-providing activities that are the critical engine in the new digital age (Kontrimiene et al., 2017). In the UK, the 'creative industries' are worth over £84 billion in 2014, accounted for 5.2% of the UK economy with a growth rate exceeding 8% over two years from 2013 (DMS, 2016). The majority of enterprises operating in this sector are SMEs, with less than 50 employees (75%) and only 5% have more than 200 employees (UK Government Report, 2010). This sector is therefore an 'enormously important' part of a modern economy (Kontrimiene et al., 2017), not only for providing economic value through economic growth and societal benefits, but it also plays an increasingly important role in the transformation of production and distribution platforms that underpin business and society in the emerging digital age.

Since Grant's (1996) introduction of the knowledge-based view of the firm, the importance of knowledge management (KM) has become widely recognised as a key element in an organisation's ability to achieve growth and competitive advantage (Bose, 2004) through improved processes, operational problem-solving, functional integration and new product development (Alegre et al., 2013). KM is even more fundamental in the knowledge-oriented and knowledge-intensive creative sector, where knowledge is

core to input, production, planning, control and output. Companies operating within the creative sector are characterised by a great diversity of knowledge, skills, profiles and behaviours, and thus managing these resources is highly complex and especially difficult for smaller enterprises with limited resources. Therefore, it is critical to ensure these often limited and scarce resources are optimised for more efficient and effective production and planning.

To date, much of the research in the extant KM literature has focused on large organisations (Cerchione et al., 2016). However, KM developed for large companies cannot be applied to SMEs (Esposito and Evangelista, 2016). KM is clearly impacted by the size of a company (Lee and Wong, 2015), where the smaller the organisation, the less formal the knowledge structure. Indeed, knowledge generated in SMEs tends to be tacit and kept in the minds of individuals, whereas knowledge generated in large organisations is more likely to be transformed and codified into a more explicit form (Cerchione et al., 2016).

Although the literature advocates the importance of knowledge management for the success of SMEs (Lakshman and Parente 2008), there is a research gap related to the impact of KM on firm performance (Cerchione et al. 2016). Knowledge has been linked to innovation performance (Alegre et al., 2013) providing opportunities for growth, new markets, new ideas and new inventions (Bessant and Tidd, 2015). Extant literature has shown how knowledge management can facilitate and enhance the innovation planning and control process from ideation to implementation / commercialisation (Hotho and Champion, 2011). Innovation, especially in the creative sector, relies on knowledge workers – people – their ability to create and share new knowledge, but our understanding of this process remains limited (Ghobadi, 2015). Organisations are advised to create an environment that supports the flow of knowledge

(Yeh et al., 2006), to enable knowledge sharing that provides employees with access to relevant information and knowledge networks within the organisation (Hogel et al., 2003). However, SMEs and particularly micro enterprises do not have the resources or infrastructure for sophisticated KM processes and systems, and thus need to have different and more cooperative models of knowledge sharing to capitalise on internal and external knowledge to improve their innovation performance (Albors et al., 2005). Few studies have investigated KM in micro/SMEs; however, much of this very limited research has examined KM in traditional manufacturing sectors. KM in the knowledge-intensive creative sector, is significantly different (Azumah et al. 2005) from traditional manufacturing sectors. Moreover, SMEs are often treated as a homogenous group, which makes comparison and understanding implications for organisations, managers and policymakers problematic (Massaro et al., 2016). Thus there is a need to examine the differences in knowledge sharing between micro and small/medium sized companies (see Table 2 for definition of sizes).

To address these gaps we distinguish between different sizes of enterprises based on number of employees to develop a more granular and in-depth understanding of KM in micro (<10), small (10-49) and medium (50-249) sized enterprises (see Table 2), operating in the innovative games/entertainment software development sector. In particular, we focus on identifying knowledge sharing practices and their role in production, planning and innovation performance. In doing so, we adopt a two-stage mixed methods approach and develop an empirically driven normative model that provides insights for managers to improve knowledge management practices to help their organisations not only survive but thrive in such a competitive sector.

The remainder of this paper is structured as follows. We will start with a background of creative industry context in section 2 followed by a review of the

literature on KM in SMEs, focusing on knowledge sharing and innovation performance in section 3. Section 4 introduces the methodology adopted in our study followed by key findings in section 5. Section 6 covers discussion of those findings along with our normative model of knowledge sharing for improving innovation performance in games/entertainment micro/SMEs In section 6, we conclude with implications of our research and recommendations for future work.

2. Context: Creative Industry

The games/entertainment software development industry is one of the most dynamic sectors in world trade, characterised by cycles of creation, production and distribution of goods and services that use creativity and intellectual capital as primary inputs (UNCTAD, 2008). This sector is also driven by constantly evolving digital technologies (Mangematin et al., 2014) cannibalisation of existing products and an ever shorter process of innovation (from ideation/exploration to commercialisation/exploitation). It is also notorious for its highly secretive culture (Aoyama and Izushi, 2003). Companies, in this industry are constantly under pressure to renew their products and services, in a highly competitive environment, to fit with the changing trends, content and needs of its international markets (Fitjar et al., 2016), while at the same time fiercely protect their intellectual property. In terms of knowledge specificities, the sector has to manage the paradox of a highly cultural diversity among its employees and the necessity to rely on strict project management constraints (Cohendet and Simon, 2007). Moreover, there is a challenge of both constantly innovating to keep up with technological developments and supporting the creativity of their teams while at the same time continuing to rationalise production processes (Parmentier and Picq, 2016). The process of production, planning and control within the games/entertainment software development (illustrated in figure 1) is complex,

knowledge-intensive, highly reliant on the specialist knowledge of individuals and must lead to innovative and desirable products. The process can be split into two main phases: an initial ideation phase composed of design-creation activities, followed by an operations phase composed of a production process that includes both programming and content production (Aoyama and Izushi, 2003) ending in the 'golden master' for market launch. Within this whole process, there is a diversity of individuals with different and dominant knowledge and skills (from artistic and creative to programming and managerial), and knowing how to combine these different types of knowledge and facilitate sharing among these different types of individuals can ultimately impact innovation performance. As such, this sector is an ideal setting to investigate in more depth the challenges that micro/SMEs face in terms of KM practices and how these can be more effectively managed in order to improve innovation performance, which is so critical for survival in the sector.

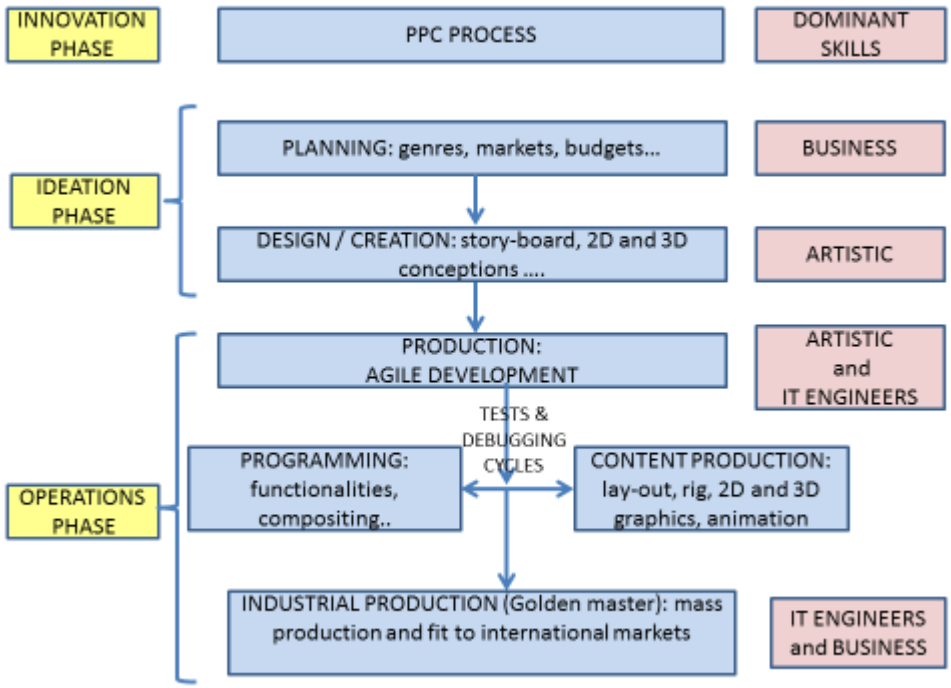

Figure 1. Production, planning and control process and related innovation phases and skills, adapted from Aoyama and Izushi (2003: 437)

3. Literature Review: Knowledge Management

With the advent of the digital age, knowledge-intensive tasks are on the increase and the numbers of knowledge workers are on the rise. Knowledge is considered to be a valuable asset and as such, must be managed and utilised wisely (Lee and Wong, 2015). Knowledge management encompasses organisational design, principles, processes, structure, applications and technology that helps knowledge workers leverage their creativity and ability to deliver value (Gurteen, 1998). The value created from knowledge and how knowledge in an organisation is shared, can contribute to organisational performance and is dependent on how knowledge is most effectively managed (Alegre et al., 2013). Thus it is necessary to investigate knowledge sharing in an organisation and how it can leverage value.

3.1 Knowledge Sharing in Organisations

The basic operations and processes of knowledge includes activities such as ideation or creation, sharing or transfer, storage, and usage (Spek and Spijkervet, 1997) which are considered to be a fundamental part of the innovation process (Bessant and Tidd, 2015). Knowledge sharing has been projected to enhance activities especially for knowledge intensive organisations. Recently, Irani et al. (2017) investigated the use of social media tools for knowledge sharing and highlighted the importance of knowledge sharing to make sense and improve decision making for product development. Sharing knowledge among product development groups reduces glitches leading to customer satisfaction and reduction in development time (Rauniar et al., 2008).

Knowledge sharing behaviours are dependent on an individual's willingness to share their knowledge and a willingness to consult others (Tohidinia and Mosakhani, 2010). It refers to behaviours involving exchanging individual experiences and work

related knowledge both explicit and tacit with others. Knowledge sharing consists of knowledge donation and knowledge collection. Knowledge donation refers to "a willingness to communicate knowledge and intellectual capital to others" whilst knowledge collection refers to "a willingness to consult with others, learn and encourage others to share knowledge and intellectual capital" (Sorakraikitikul and Siengthai, 2014:p177). In a study of knowledge sharing in large organisation, Lin (2007) found there was no distinction between knowledge donation and knowledge collection on the impact of innovation capability in firms. Furthermore, enjoyment in helping others and knowledge self-efficacy were found to positively influence knowledge donating and knowledge collecting. Tohidinia and Mosakhani (2010) similarly found no difference between knowledge donation and knowledge collection in their study of knowledge sharing. They concluded that organisational climate, self-efficacy and reciprocal behaviour impacted knowledge sharing. However, both studies were quantitative, and conducted in large organisations across a number of industries in what is commonly identified as collectivist countries (Taiwan and Iran respectively), which might not be generally applicable to different organisational contexts and research settings.

3.2 Knowledge Sharing for Innovation Performance

Knowledge sharing can improve innovation capability between supplier and manufacturer (Delbufalo, 2017). Although previous research has shown the importance of KS in enhancing organisational performance, (Lakshman and Parente 2008), there is an inconsistency in the literature about exactly which measure of performance is impacted by KS, as these can broadly range from human and technical to financial and economic measures (Cerchione et al. 2016). For example, performance indicators include firm growth and profit over a period of time benchmarked against competitors

(Gomezelj Omerzel and Antoncic 2008); meeting strategic objectives indicate performance improvements (Chi et al., 2008). As the the use of social media in KS is increasing, emerging studies have tended to focus on customer knowledge acquisition from social media to enhance customer relationship management in large organisations (Chua and Banerjee, 2013) and improve product innovation (Nguyen et al., 2015).

With the now almost ubiquitous political and organisational acceptance of, and engagement, with the 'innovation imperative', the idea that innovation is critical to competition and growth at an organisational, national and international level (Laosirihongthong et al., 2014) has moved innovation as a measure of performance, centre stage. Innovation is seen by many scholars as providing opportunities for growth, new markets, new ideas and new inventions (Shaw and Burgess 2013). Innovation is said to be a function of the firm's structure ,thus innovative processes also lie at the core of the firm (Leonard-Barton, 1995). Knowledge is seen as an agent for innovation (Rauch-Geelhaar et al., 2003), where knowledge sharing, especially tacit knowledge, may lead to innovation (Irani et al., 2017) . As knowledge sharing occurs at both the individual and firm level, firms often use the individual mode of knowledge sharing to capture knowledge on a larger scale.

Lin (2007) developed a framework based on large manufacturing companies to investigate knowledge sharing and identified human (individual), organisational and technological factors which impact a firm's innovation capability (illustrated in figure 2). But this model does not provide any detail or insights about the role of knowledge sharing in the process of innovation performance.

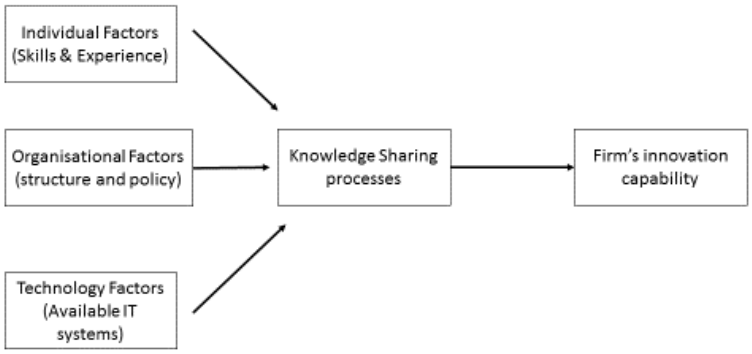

Figure 2. A General Framework for Knowledge Sharing (adapted from Lin, 2007)

For innovation, SMEs might need to adopt knowledge from external sources, (Alexander and Childe, 2013), such as clients and customers especially in the creative industries who are often a source of innovation related information (Laosirihongthong et al., 2014). SMEs therefore need to consider new and more relevant models of knowledge sharing to enable them to capitalise on their innovation performance, which are currently underdeveloped (Albors et al., 2005).

3.3 Concluding Literature Review

From the literature, we have identified a distinction between the practice of SMEs and large organisations where extant KM theories and systems developed in the context of the latter, may not necessarily be suitable or relevant for SMEs. Moreover, solutions presented in the literature, if followed by micro/SMEs, might lead them to lose their distinct characteristics and capabilities to act (Durst and Edvardsson, 2012). Research in KM in SMEs has focused mostly on investigating knowledge as a process and there is limited research in knowledge for innovation (Massaro et al., 2016). However, as

innovation consists of successful exploitation of new ideas this is associated with the creation and use of knowledge (Alegre et al., 2013). There is therefore a need to investigate in more detail the kind of KM practices, in particular knowledge sharing, in SMEs (Cerchione et al., 2016). Moreover, with innovation moving centre stage of performance measurement, especially for SMEs in a highly competitive and creative industry sector, it is important to understand how knowledge sharing impacts innovation and performance. Although research in KM for SMEs is increasing, the impact of KMs on firm performance, in particular, in highly creative and knowledge-intensive industry is still under-researched (Esposito and Evangelista, 2016). Most knowledge sharing and innovation performance research is in more traditional production literature (Nagati & Rebolledo, 2013). Indeed, this body of knowledge remains 'poor and fragmented' and requires more intense research (Edvardsson and Durst, 2013).

This study thus aims to build on the work of innovation and knowledge management scholars and develop in more depth the understanding of knowledge management especially the role of knowledge sharing on innovation performance in micro/SMEs in the creative sector of games/entertainment software development.

4. Methodology

Much of the past research in knowledge sharing and SMEs has tended to be quantitative. Mixed method approaches have been used in knowledge sharing and innovation research to explore in more detail the practices of knowledge management, particularly when the area is still under researched (Shaw and Burgess, 2013). The intention of this study is not to present findings that are generalizable or representative, but rather to build our understanding by providing more detailed insights into the role of knowledge sharing in the planning, production and innovation performance of micro/SMEs operating in the UK creative sector. For our study we adopt a two stage

sequential explanatory mixed method approach (see figure 3) to first explore and refine issues related to our research setting, to inform the research instrument (interview protocol) and identify cases for more in-depth explanatory investigation for stage two of our research (Easterby-Smith et al., 2016).

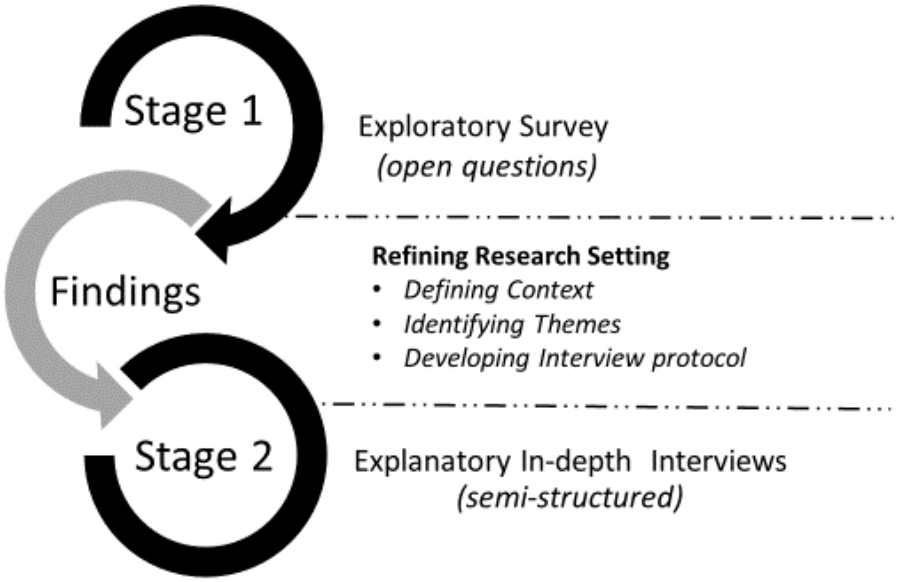

Figure 3: Explanatory Mixed Methods Research Approach

4.1 Stage One: Data Collection & Analysis

An initial exploratory survey was used to define the context and identify themes to better understand the role of knowledge sharing in working practices and process of production and planning of games/entertainment software development in the creative sector, which is our research setting. A questionnaire was designed and distributed by email to a sample of owners and /or CEOs of micro/SMEs in this 'creative' sector in the UK. This sample was purposive, in that it drew on a database of all the existing contacts within a professional network of games software development businesses (micro/SMEs) associated with the researchers' institutions in the UK of whom there were 50 registered. These companies had been operating successfully for over 5 years – beyond

the average life-span of an SME (Mason, 2009). The questionnaire was based on mainly open questions, to elicit the views of the respondents and identify areas for further and more detailed exploration. Questions included demographics (company size, turnover, nature of the company and projects); description of collaborators and nature of collaborations; working practices and knowledge sharing within the organisation and with partners; the process of production and planning of games development; skills they had and those they required; support they might need; initiatives that might improve their performance. We also asked respondents whether they would be available for an in-depth interview. Of the 50 companies contacted, 19 completed and returned the survey by email within 4 weeks.

The findings from the first exploratory survey, helped us to further refine and scope the next explanatory phase of the research. The responses from the survey were consolidated and organised into broad themes that required further explanation. The mapping of the survey topics, the issues raised, emergent themes and how they informed the development of the research instrument for stage two are summarised in table 1.

Table 1. Mapping of Stage 1 Research Findings to Stage 2 Research Scoping

4.2 Stage Two: Data Collection & Analysis

As this stage was explanatory, our objectives were for the respondents to present their understanding of issues such as knowledge management, knowledge sharing, innovation and performance. We did not expect our respondents to have a common understanding of the nomenclature/jargon in the literature (for instance KM, innovation, etc.), as such we probed their understanding of these terms and allowed them to explain what they did and how they did it in their own language. The research instrument (semi-structured

interview protocol) informed by stage 1 is summarised in table 1 and includes questions about individual demographics, organisational details and information about projects, performance measures used, innovation process, knowledge management practices, collaboration, use of digital tools for acquiring, sharing and transferring knowledge, knowledge and the innovation process.

A sub-set of 8 UK based micro/SMEs from the total respondents in stage 1, agreed to take further part in the study. These companies included games development, digital TV platform/content developers, web designer and animation. The respondents were contacted and interviews were arranged with senior managers/owners of the companies in key roles related to planning production and innovation in the organisation, such as Project manager, innovation director, CEO/owner, chief technology officer (summarised in table 2). The semi-structured interviews lasting on average around one hour, were conducted mainly face-to-face at the respondents' premises, but in a couple of instances by telephone/ Skype. With the consent of the respondents, the interviews were recorded and were then transcribed for analysis.

Table 2. Summary of Interviewee Profiles

Following Yin (2016) the data, were compiled into a formal database for careful and methodical organising of the original data. Then the data were compiled into smaller fragments and assigned initial codes. The process of coding and analysis followed a systematic and iterative process following Miles et al. (2014), where data were organised into categories and sub-categories and coded based on the common themes that emerged. We allowed concepts and patterns to emerge from the primary data through an iterative process and the categories were then reassembled and re-organised

into substantive themes consistent with the research questions of the role of knowledge sharing on production, planning and innovation performance in micro/SMEs operating in the highly innovative creative sector. These reassembled data are presented in the findings and will be further interpreted in the discussion sections.

5. Findings

Firstly, the survey findings (in section 4.1) helped us refine the research setting by providing a useful understanding of the context and identify issues requiring further investigation. The stage 2 findings (in section 4.2) provide more detailed and explanatory insights of knowledge sharing in production and planning and the impact on innovation performance in a selection of UK micro/SMEs in the creative sector.

5.1 Research Setting: Context and Issues

There were several issues (highlighted in bold) that emerged from the first stage (summarized in table 1). One of the major issues raised by all the survey respondents (micro, small and medium) in stage 1 is the importance of the individuals working in the sector as the source and gatekeepers of knowledge and expertise. The ***production and planning*** of projects is highly dependent on the ***knowledge and capabilities*** of its employees. All the respondents identified this as not just technical and creative knowledge (programming, graphics, animation), but also management (project and general). All the respondents identified a real ***shortage of employees*** within the sector with the right ***capabilities and knowledge.*** It is common for individuals to take on several roles, including production, management and design (***multi-taskers***). Developing products in the creative sector is dynamic and project-based, where different knowledge and capabilities are required, dependent on the type and specification of the component in the project under development.

All the survey respondents reported that they ***outsourced*** at least one or more tasks in the production of their games, providing some insights into how any ***capability and knowledge gaps*** are filled. The most frequently ***outsourced task*** identified in our survey was audio/sound related followed by localisation (including translation and conforming to local classification laws and regulations[1]), art/graphics and animation related tasks. Programming, scriptwriting and art related tasks were outsourced by micro organisations with 6 or fewer employees. However, audio/sound related tasks were an outsourced requirement for the majority of companies regardless of size. Localisation was also an outsourced task required by companies of all sizes because country specific local expertise and knowledge was found outside the organisation.

We found a very ***closed and secretive environment*** in which the micro/SMEs were operating. For instance, many respondents noted they were unable to report on the projects and also range and type of resources they used for the internal production of their software. There was an imperative throughout the sector on ***controlling confidentiality and secrecy from production and planning to marketing***. All our respondents cited requirements to sign non-disclosure agreements from the games format manufacturers to protect their intellectual property (the platforms) and from a marketing perspective, the publishers, insist on launch details and dates being tightly controlled. However, some respondents described how they shared ***expensive technology resources*** to enable trusted micro/SMEs to produce their games, for instance rendering software or 3D/VR engines.

Another theme that emerged from this exploratory phase was related to

[1] for example in the case of Germany, blood had to be coloured purple to pass the classification board

performance. Respondents highlighted the importance of creating original ***intellectual property (IP) from the production*** of new games/entertainment software that belonged to them, and that would sustain them financially. However, it was common in the sector to produce games under licence and thus some micro/SMEs did not own the IP. One respondent reported that they tend to focus on projects that were going to make money in the ***short term*** rather than investing in R&D.

Over half of our respondents reported collaborating (54%) on projects, however the exact nature of this collaboration and the type of knowledge sharing and innovation created within these collaborations was unclear and required further explanation.

From this stage we have highlighted several areas that require further in-depth investigation and summarised in table 1. Namely, more detailed understanding of the production and planning process, knowledge sharing practices and its role, a better understanding of innovation in this process and how performance is evaluated.

5.2 In-Depth Findings from Micro/SME

Data analysis from the first stage underlined the importance of individuals, their knowledge and capabilities in the production and planning of games/entertainment software development in micro/SMEs. The initial findings from stage 2 of the research design are organised into broad themes that are not mutually exclusive, extracted from the analysis of the data (summarised in table 1). These are (a) knowledge management practices – including knowledge sharing (b) operational factors involved in the production and planning process (c) performance factors including importance of IP and innovation (d) organisational factors – namely size and structure on the planning and production process.

5.2.1 Knowledge Management Practices

Many of our respondents misconstrued knowledge and information. Most in our study, stored some types of information (such as documents and specification sheets) but referred to this as knowledge and similarly none of our micro/SMEs had a dedicated knowledge management system. The majority were using similar technology, web-based platforms, mainly for transferring information and for improving and making more efficient the administration and management of the innovation operations process. Table 3 below shows the knowledge sharing process adopted by our respondent enterprises and the tools used during this process.

Table 3: SMEs Knowledge Sharing Practices and impact

All the respondents described the first ideation phase of the innovation process as very unstructured, where sharing ideas and knowledge is largely organic and free flowing. The CEO of one small enterprise described the process as,

> *"very informal. We normally start at the pub and then go from there. There's no document, we'll generally throw some ideas around …. Draw some sketches … pitch it internally" (SE1)*

Once these tacit ideas had been made more explicit, they were open to receiving feedback internally but also from their potential customers,

> *we'll create something very quickly like a basic product and then we'll take feedback from all the customers. Most of the things they want, we try and kind of accommodate so it kind of develops and evolves through time (ME2)*

But for both medium and small companies this is a dynamic and iterative process that is a quite flexible, and responsive to feedback, where there is nothing too formal, and sufficient for demonstrating proof of concept.

5.2.1.1 Collaboration & Knowledge Sharing

Interestingly, when our respondents were questioned in-depth about collaborations, it became very clear, that collaboration in the sense of having organisations partnering with each other was very rare for micro/SMEs in the creative sector. All our respondents in all sized organisations were very clear that there was no external partnering in the innovation process (ideation → commercialisation).

> *not as a company partnership, no. (ME2)*
>
> *[we] don't really do collaborations, (SE5)*
>
> *Partners no. We tend to work with very specific projects … So we tend not to work in partnership and we don't pitch for business, people contact us. But we don't have partners, (MiE7)*

Because it is such a highly competitive and intensely innovative and creative sector innovation and IP is of critical importance. The knowledge and expertise that reside in the individuals is central to the development of the software, and so partnership and collaboration does not happen for any of our micro/SMEs. One respondent explained that where collaborations (which he termed joint ventures) do exist, then they create a separate entity to ensure that IP is clearly attributed to each entity.

> *In some projects we design games that we own completely, in other cases, some customers will ask us to create a game specifically for them and in that case, they will own the IP and in other cases we have games that are joint ventures between customers and ourselves and usually in those cases there's a new company or joint venture in which the IP resides (SE4)*

Internally however, within the project teams, much of the information shared is very tacit and specific. Although a myriad of tools are used to share information, for instance

blogs, wikis, debugging trackers, online chat history, task-tracking, informal chatting is the most common and effective way of solving problems and sharing knowledge. This is something common to all our respondents, regardless of size. As medium enterprise CTO (ME3b) described a system based on social network principles of content generation and subscriptions to different information feeds within the organisation, he concluded that,

> *I think that's probably the way forward that more formal and probably larger companies rather than small companies, would get benefit, because the issue disappears when you have a smaller company because everybody talks to each other. As soon as people can't physically talk to each other, then you start getting issues with disseminating the information (ME3b)*

Here, the emphasis is that in this sector, with this type of creative work, talking is the most important medium for sharing and disseminating information.

5.2.2 Organisational Factors: Size

Organisational size was one of the most dominant factors that emerged from our respondents. This was critical for building a close team environment with the structures that enabled knowledge sharing. Although these themes are presented separately here, they are inter-related.

5.2.2.1 Structure

Production and planning of innovative games/entertainment software development, was described by our respondents as a collective endeavour. Because of their organisational size and structure, there is much easier communication because of the more informal processes, where 'the whole team have a transparent method of planning and

communicating' and being open and inclusive,

> *I think due to me being open and kind of filtering down through the structure it means we get more out of our employees hopefully than we would do otherwise (SE1)*
>
> *all projects we work on are the projects we want to work on (SE5)*

Our respondents explained how the small size and informal structures facilitate the sense of each individual being part of a collective activity and developing a sense of collective inclusion. Interestingly, for all our enterprises, maintaining a small size and informal information and knowledge structures are important as the focus is not primarily and solely on individual capability, but also about the personality of the employees and fitting in with the group.

> *Like a rock band, … we just get on really well, we're all on the same kind of page with design and stuff …. We'd rather hire someone who a) is a cool person b) knows the work c) is a programmer, so not necessarily a programmer first or an artist first, it's whether they've got a good personality as well, because you can get some people who are very good at their jobs but you just wouldn't want to talk to them (SE5)*

Size is considered by our respondents as one of the advantages for operating in this highly competitive and creative sector. Being small means that they are able to be flexible, and fully utilise all the skills of their people who often are multi-taskers, operating on several tasks. The CEO of a small games developer explained how,

> *We get offered projects a lot of the time which we've needed to expand massively and normally we turn them down because we like..., people join us because they like the small culture of it and I don't think we could go much*

above 25 without losing that, so if we were to expand I think it would have to be almost like two separate studios, (SE1)

In this instance projects are turned down if they do not fit with the small scale environment and structure of the organisation and its people. For this respondent, keeping a small size is critical and if they grow beyond that, then they would create a separate but equally small entity.

We gained an additional insight into the importance of the multi-tasking role of employees, which is based on cross-functional planning and working. One co-founder of a micro enterprise, described how individuals within teams are responsible for the planning and communication process, which they see as being unique, but again enabled by firm size,

when we design a new game, we do market analyses and we build the marketing and we build the monetisation and the metrics and the type of game that we're building… the whole team have a transparent method of planning and communicating the whole idea and then we break up that process into a very small cross functional team and that functional team then manage all aspects of the game. So all people are doing game design and all people are doing programming and all people are doing marketing so that's a very small team that has a very very cross functional role and that's pretty unique in the video games industry (MiE 7 co-founder)

The theme of maintaining small teams and organisations in order to be creative was echoed by the CTO in a medium sized enterprise (ME3) who explained how, as a medium enterprise of 140 employees, they are 'split into strategic business units

(SBUs)' so that they can operate as a much smaller organisation, which allowed them the flexibility to behave more creatively.

The firms that had more employees usually had an overall hierarchical structure, but there was decentralization in the firm's management when it came to the creative innovation process. In this respect, they purposely operated in small teams and operated like a flat structured organisation.

4.2.2.2 Environment

Organisational size for the respondents in our study plays a critical role in the whole innovation production process. Respondents spoke of size in way that was synonymous with culture. A small size enables an environment where creativity can thrive and allows individuals to be given the freedom to work on projects in which they are interested. The nature of games/entertainment software development is highly creative, highly innovative and is very much dependent on the individuals, who are driven by the "freedoms" given to them by the organisation that allow them to be creative.

> *The other thing which is important at ME3 is their actual culture, ... a lot of them have moved from other parts of the country, for instance [London] where there are other technology centres and [Manchester] ... so they're not that necessarily as driven by material aspects, because they could earn a lot more money if they were down in [London] or [Manchester]. So they tend to want to develop these ideas themselves and push their own ideas rather than necessarily being focused on money (ME3b)*

Thus size also is critical for attracting and retaining people and reinforcing an environment that enables transparent planning and inclusion of all the creative individuals in decision-making processes. It also enables an informal structure

which is evident throughout the innovation and production process.5.2.3 Operational Factors

For the micro/SMEs in our study, the production and planning process is intentionally informal as formality is considered to stifle creativity,

> *If they have an idea, they'll tend to develop that, if you will, in the background so you don't know that that's happening and then all of a sudden they'll have a demonstration of some ideas that they've got and then that'll be shown to somebody and somebody will like that and that will get turned into a product at some point, so it's quite informal. It's not necessarily like Google where you have 20% time, it's more like very very informal and people do this in their own time for their own interests (ME3b)*

The owners/managers of medium enterprises in particular are very sensitive to over-formal processes and have designed their production and planning processes accordingly. They understand the need for informality to ensure an environment that fosters innovation and creativity, but at the same time, there are operational processes required to keep order and track of the progress of the production. For one medium sized company, they acknowledge the challenge and are trying to manage it very carefully,

> *We are probably going to need more processes in place and hopefully keep kind of an innovative environment, agile, the challenge I think is having the processes that don't restrict you too much but keep a bit of order (ME2)*

However, more formal production and planning processes are introduced for the administration of the technical part of the production process, developing the code. Here, there is a process of (a) 'tracking day to day micro tasks of people to make sure

they are delivering stuff for when it's needed for the departments' (b) checklists to ensure the artists have created something to specification (c) programmers who then have to go through the process of version control and bug tracking. This is implemented in all sized organisations and they all have tools to manage this process throughout the lifecycle of the project.

All of the respondents described a very light touch management process, they are cautious of being too managerial and so several team leaders are assigned to projects based on their areas of expertise and specific knowledge. One founder of a small enterprise described this process,

> *We have pseudo-leads, by that what I mean is each person takes responsibility but they're not called lead in a job title, … we rotate them around with a project so in this project we've got four leads … and then you know the next project, same positions but might be different people in them, it's just whoever's suited to the best project (SE5)*

In this case, they are termed 'pseudo' leads to avoid any notion of centralised control by an individual. This reveals further evidence of a collective multi-tasking and multi-functional approach to production of innovative projects. In this context, the management of people is critical, and so the production planning and control is organised primarily around the people, where they are rotated and changed and kept engaged, by for instance choosing which pieces of work they want to take on. One small enterprise founder described how he had to plan projects in a way that kept his key people engaged.

> *We might have a huge project for two years and we'll have a five month project, something quick with three or four people on it and then another big one again.*

It's good for us as well because it means we can break up our time and have a little bit more fun, let your hair down and do something crazy (SE5)

5.2.4 Performance

The end product is clearly a measure of performance for these micro/SMEs, but, interestingly, the majority of the respondents, and the micro and small owners in particular, were not financially motivated. Rather, they were driven by the innovation of the products (games/software) they were developing and the pleasure they were getting from the work.

the financial motivation is largely irrelevant, but the cultural emotional responsibility,… the culture that we've built around our business and the type of work that we get to do, that's its reward. So the incentive is that we get to work on very very interesting projects and you get to own a very significant part of those ideas (MiE7)

It's not the case of "we must make money, we must buy the bank" it's more a case of we maybe want to make it if it makes money, they always do, but it's not only important how much to make money but it does help (SE5)

The main measures of performance in SMEs centred on innovation and IP, but for all respondents, measures of performance were also intangible, experiential and deeply embedded in the type of work they do, and whether the work had been interesting, and engaging to the collective team. In this instance, performance is linked to a collective sense of satisfaction and enjoyment in the process of having created a great final product.

It is not just the innovation and creativity of the product, but also the technical quality and accuracy of the product that was another important measure of performance. This part of the production process is closely monitored and controlled and emerged from discussions of the importance of operational measures – such as version control, debugging the software and technical expertise – to ensure a technically high quality product is developed.

5.2 Summary

Our empirical data showed that individual factors (knowledge, capabilities and engagement of individuals), organisational factors (structure and environment driven by size) and operational factors (informal, formal and innovation processes) are very important to knowledge sharing processes and ultimately the performance of our sample of micro/small and medium enterprises operating in the creative games/entertainment software development industry. These factors are mutually interdependent, non-linear and non-sequential. The discussion, an empirical model incorporating these findings and further implications are presented in the next section..

6. Discussion

Our findings offer a very interesting insight into micro/SMEs operating in a competitive, creative, knowledge intensive sector. The types of knowledge management practices clearly fall into two categories – the formal and the informal, which are closely related to the innovation process starting with ideation (informal) and moving to production planning and development (formal and informal) and ultimately the final product (Mariello, 2007). Similar to other studies, we found that the two phases involve different types of knowledge that are directly related to innovation performance and also impact operations performance of firms (Aboelmaged 2014). But in our micro/SMEs cases, it is the same individuals who have the different types of knowledge

and apply them in the different phases when required.

6.1 Knowledge sharing in micro/SMEs

The micro/SMEs in our study did not have a dedicated knowledge management system in the sense described in the literature as being a set of organisational design, principles, structures, application and technology to help knowledge workers leverage their creativity and ability to deliver value (Gurteen, 1998). Although, all of our micro/SMEs were using digital tools, these functioned mainly as a repository for storing and accessing specific data and information. In this context, these 'KMS' are mainly to control the operations and production process, to ensure that projects are kept on track and all components, of what are complex projects, are accessible and can be compiled together in a final product. In our case, the KMS is used for one part of the production process and that is project management of the software being developed. The knowledge is explicit, document based, codified and stored but relates to version control, de-bugging, and specification management of the project.

We found that much of the knowledge within our micro/SMEs, which generates value is tacit and remains firmly within the minds of individuals, consistent with Cerchione et al. (2016). These individuals have both the capabilities and expert knowledge and make a valuable contribution to each project under development. Knowledge is manifested in the individuals who donate their knowledge for the duration of a project. When expert knowledge is required by micro/SMEs, individuals are sourced externally or from within the organisation.

6.1.1 Knowledge Donors

The process and production of games development includes several elements of expertise including scriptwriting, animation, art/graphics, localisation and audio (as per

Figure 1). Micro/SMEs often do not have the in-house expertise to be able to deliver ***all*** these highly specialist elements for a complete product (game). In addition, there is a shortage of expertise in this highly specialised and dynamic creative sector. Consequently, the different components of a complete games development project are sometimes outsourced to experts with the required knowledge and capabilities. Those with the necessary expertise are temporarily brought in to work on their specific task and leave once their task is completed. In this case, knowledge is 'donated' by individuals, and used by recipient micro/SMEs for that particular project. There is no wider sharing of that expert knowledge from these outside knowledge donors. From the firm's perspective, this expert knowledge is temporal and might not be relevant to the next commissioned project. From the external knowledge donor's perspective, having that knowledge in a highly competitive and fast moving creative sector, is their means of survival, which might make them unwilling to share it with the SME recipient.

Looking within the organisation, a similar knowledge sharing practice of 'donating' knowledge is observed, but there is limited evidence of knowledge 'collection'. The majority of our micro/SMEs described a very informal process of knowledge sharing, which was done largely through face-to-face interactions in very informal situations (over lunch, coffee, at the bar, or just chatting). Even when new digital technologies were used (for instance instant messaging (IM), email, social media, Google hangouts etc.), this type of knowledge sharing was not formally codified, stored, organised or accessible. Moreover, this type of knowledge sharing was very restricted, it appeared to be ad hoc, temporal, on a 'need to know' basis and instigated through enquiry. In one instance, to preserve the circle of knowledge sharing, one small enterprise had created their own platform enabling knowledge sharing only with those that could understand the language of the platform, but similar to the other cases, the

tacit knowledge was not stored in any repository or formally organised or codified. So although there is evidence of knowledge donation, evidence of knowledge collection is scant, although the knowledge is consumed within the project to generate the innovation.

Unlike the findings of Lin (2007) and Tohidinia and Mosakhani, (2010) who highlighted knowledge sharing practices, in our creative micro/SMEs we found evidence of a distinction between the knowledge donation and knowledge collection practices in the knowledge sharing process. Our evidence suggests they are not mutually inclusive and related to each other. Indeed, the knowledge sharing process we observed is very informal, intangible and largely tacit and is mainly done in a face-to-face setting. Digital platforms and technologies are used merely to transfer information or to communicate, rather than to explicitly share knowledge. Accessing individuals is easier within the smaller physical space of micro/SMEs and provides a richer medium (Daft and Lengel 1986) compared to formal means of knowledge sharing (including KMS) which are considered to be too cumbersome and costly (Edvardsoon and Durst, 2013). This is a practice we observed in our micro/SMEs, where employees, or knowledge donors, were allocated to different projects and multi-tasks where they could directly 'donate' their knowledge to other areas of the project and within other teams. Indeed high level flexibility and ability to work in changing team structures has been shown by researchers to improve performance (Rauch-Geelhaar et al. 2003) and all our respondents, including medium enterprises, reported this as best practice.

Our findings are contrary to Lin's (2007) study, which was conducted in large organisations. Employees in our micro/SMEs are not attracted by a cash/reward system, but are specifically attracted by the creative freedoms, the informal organisational structures and environment created by small team working that is afforded by our

micro/SMEs. Our study also shows that even medium sized enterprises tried to emulate smaller sized firms, by actively breaking down teams into small groups and business units so that they can capitalise on informal structures which builds a working environment conducive to creativity and informal processes of knowledge sharing.

6.1.2 Innovation Performance

Our findings further suggest that both the informal and formal KS processes are equally as important for innovation performance improvement. Complementary to the tacit KS in the first phase of innovation, formal and codified KS in the implementation phase helps to improve operations, production management and control of the highly innovative and creative products being developed. Our proposed model goes some way to address Ghobadi's (2015) patchiness in understanding the process of KS in other industries and sectors in the knowledge economy, and offers an insight into how the people, organisational structure, and different types of knowledge sharing impact innovation and improve overall performance.

6.2 Proposed Model: Knowledge Sharing and Innovation Performance in Micro/SMEs

The relationship between innovation and knowledge sharing in a highly competitive and creative sector is complex. Our findings in the context of micro/SMEs operating in the creative sector are consistent with some aspects of Shaw and Burgess' (2013) study of large utility companies; that the more technical in nature the innovation, the less likely that knowledge is to be shared. Innovation, which is here characterised by the development of highly novel, creative and technical products in a fast moving and competitive sector reliant on the knowledge and capabilities of the individuals and project teams, does indeed impact knowledge sharing. Our study reveals an implicit reluctance for individuals to formally share their knowledge in a way that can be

codified and stored giving rise to the observed practice of knowledge donation both by internal and external individual knowledge donors.

Building on Lin's (2007) knowledge sharing framework, we develop a model (figure 4) based on our empirical findings of knowledge sharing and its role in innovation performance in micro/SMEs operating in the creative sector. Innovation performance is a two stage process, where the innovation moves from the amorphous ideation phase (phase A), to applied production, planning and development (phase B operations). Our model shows that the knowledge sharing process is influenced by the industry/sector context, individual factors and organisational factors. Individual factors, specifically people's knowledge, capabilities and engagement, are central to the ideation stage, which is the first part of the innovation process (phase A). The main motivation for knowledge sharing by individuals in our creative sector micro/SMEs is driven by the organisational factors driven by size in which they work.

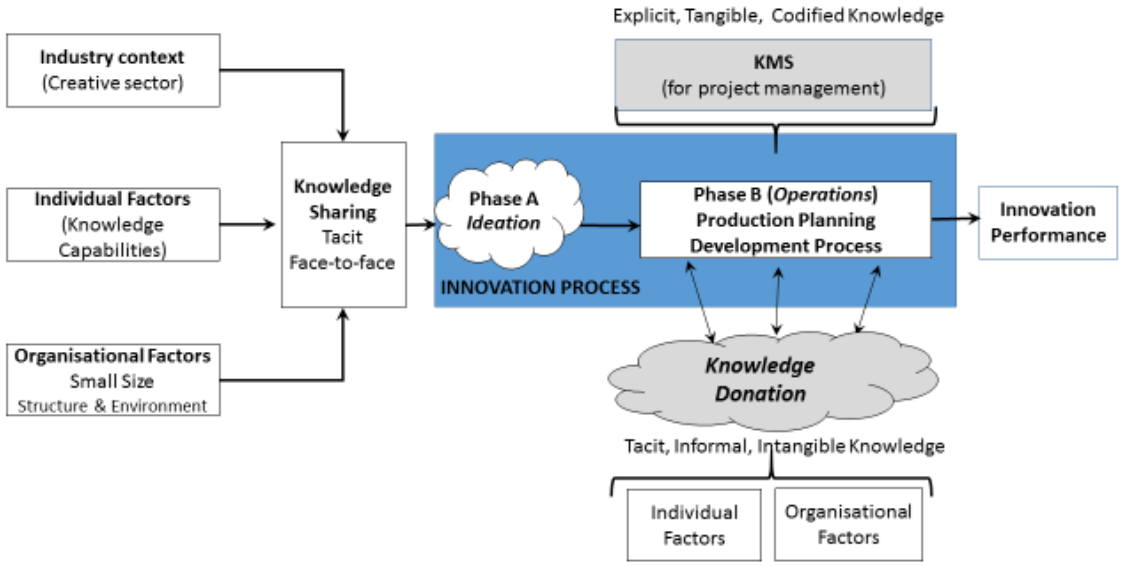

Figure 4. A Model of Knowledge Sharing and Innovation Performance in micro/SMEs

The ideation phase is impacted largely by donation of tacit knowledge, which is shared

informally and mainly face-to-face and is dependent on the individuals and their knowledge and capabilities and the structure of the organisations that enables them to make a fundamental contribution to the innovation process. This tacit knowledge is neither formally stored nor codified and the ideation phase (phase A) of the innovation process is one which is flexible, dynamic and highly reliant on its people and structure. It is the organisational and individual factors together that generate innovation performance in the early stages. This leads to the next stage of the innovation process phase (B), the knowledge sharing process is a split between creative and technical knowledge donated by individuals as and when they are needed, it is still tacit, uncodified, intangible and informal. We found evidence of a very informal intangible 'knowledge donation management' process, which is key to ensuring that the right individual with the right knowledge are located within the right project areas at the right time, in order to donate their knowledge. Knowledge oriented towards more formal operations driven project management planning, production and control is explicit, tangible, organised codified and stored in central KMS databases. This KMS uniquely holds information and knowledge to ensure that the end product (game/entertainment software) is planned controlled and produced effectively and efficiently through a rigorous debugging and version control process to generate a technically high quality product which incorporates the creative innovation.

Our empirically driven model provides a deeper insight into the importance of individual knowledge and organisational size and resulting structure in the process of innovation improvement in micro/SMEs operating in a highly creative sector. Innovation performance relies on the ability of people and organisational structure to donate knowledge, in different ways and throughout different phases of the innovation process. It illustrates how micro/SMEs have developed their own informal knowledge

donation management system – which involves a donation of the knowledge and expert capabilities needed for a project at a specific moment in time. Once this knowledge is donated, it is consumed and there might not be any further need for this specific knowledge, which might quickly become out of date or irrelevant for the next project.

Micro/SMEs by their very nature of being nimble and agile enhance this innovation process, which not only improves innovation performance, but also the quality of the product being developed.

7. Conclusion

Extant literature on knowledge management in SMEs often highlights the inefficient use of resources and poor delivery performance whereby SMEs are commonly reactive (Albors et al. 2005) rather than proactive. However, from our study in the context of micro/SMEs operating in a highly competitive and creative sector - we found that companies are not affected by the lack of a formal knowledge management system, especially in the early stages of the innovation process. In a temporal and fast moving environment, where creating the 'new' game/product means that knowledge critical to the ideation phase of the innovation process has to be constantly novel and fresh, a KMS would slow down this process to such an extent that the micro/SMEs would not be able to react to the ever changing trends in the entertainment sector.

Thus, contrary to the extant literature micro/SMEs are not disadvantaged by their size and lack of resources, rather the small size of firms facilitates knowledge sharing and knowledge donation in the production and planning process which ultimately improves innovation performance. We also found that our medium sized enterprises deliberately operate as micro/SMEs to capitalise on the organisational factors that play such an important role in improving innovation performance in the creative sector. It is also evident from our findings that knowledge sharing in its true

form (donation and collection) (Lin, 2007) happens only in the ideation phase whilst in the second stage we identified that only knowledge donation takes place.

Furthermore, most of the literature using the concept of knowledge sharing as a process of donation and collection is mainly quantitative (Sorakraikitikul, and Siengthai, 2014). These studies (Lin, 2007; Tohidinia and Mosakhani, 2010) found no significant difference between the process of knowledge donation and collection. Our in-depth qualitative approach challenges this conceptualisation of the knowledge sharing process, and provides some evidence that knowledge donation and collection are not mutually inclusive in the process of knowledge sharing. We found evidence of knowledge donation but no knowledge collection in the innovation process and this requires further investigation.

For micro/SMEs in the creative sector, people are the main source of knowledge. There might not be a formal database for knowledge management or decision support systems, however, working together in small teams enables knowledge sharing processes. These individuals should therefore be allowed the freedom to be innovative and donate their knowledge when required. This is critical for improving innovation performance and product development. Critical tacit knowledge is notoriously difficult to codify and share formally, and our research found that SMEs are at the forefront in the creative sector precisely because of their smaller size, which facilitates that sharing informally through face-to-face interactions.

One limitation of our research is that it considers only firms with 1 to 147 employees, and may not be generalisable to larger SMEs. Further research will need to check the validity of our results to larger SMEs. In addition, the process of knowledge donation and collection in different contexts such as manufacturing or healthcare could be explored through a qualitative approach.

There could be several managerial challenges, for example how employees engage in the knowledge sharing process for SMEs who are not co-located. What would the knowledge sharing process be like when members meet virtually rather than in face-to-face physical settings?

In addition, the use of technologies such as big data in the knowledge sharing process will be interesting to explore. How users' experience is used (Bauckhage et al., 2015) to share knowledge for product design could be explored further. Owing to the Internet of Things (IoT), the future generation of creative industry will probably develop scripts that mix actions both in the virtual and real world.

Implications of this study are twofold. Firstly manager/owners of micro/SMEs need to develop a mechanism for knowledge collection within their organisations, particularly in the production phase of the innovation process. Secondly, instead of operationalising people for different activities when resources are scarce, they need to ensure that these people are allowed the space to share knowledge in an environment that nurtures their creativity and positively impacts innovation performance.

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Table 1. Mapping of Stage 1 Research Findings to Stage 2 Research Scoping

Stage 1: Survey questions	*Issues*	*Details*	*Themes for further exploration*	*Stage 2: Semi-Structured Interview Questions*
Demographics	Size/Turnover/monthly burn rate	Turnover increasing over the past year Demand for staff mirrored growth in turnover	*Mainly micro and small (>50) companies employees*	*Demographics (organisation and individual) of respondents*
Collaborators and Partners	Over half collaborate with partners Most companies outsource specialist tasks	Industry characterised by contract/project-based staff – where more staff were recruited for a specific contract or project but were then released after completion of the project. Specialists in Audio/localisation/video/arts/graphics	*Outsourcing & Collaboration* *Individual capabilities and knowledge*	*What is the nature of collaborations in your company? Where is the knowledge/expertise? How is it shared/ transferred/ acquired?*
Working Practices	Informal structures with project 'leads' Flat rather than hierarchical	Structure of companies in terms of roles fulfilled by employees is a flat/team oriented structure rather than hierarchical – where there is a "lead" member of staff heading a team rather than structured hierarchies of personnel.	*Nature of production planning and control of projects*	*Organisational details including roles of employees within the organisation and in projects*
	• Team-based working (programmers and artists) • Multi-tasking roles	Job roles are not uniform or highly structured, individuals sometimes multi-task and perform several functions in the organisation e.g. (production/management/design)	*Multi-tasking roles* *Nature of production planning and control of project*	*What is the process of production and planning for developing a game/product?* *Probe for the role of innovation and knowledge in the process*
Skills & Knowledge	• Programming • Graphics/art • Management • Knowledge of different games formats	- Skills shortages in addition to management (general and project), - Technical: Programming for different platforms; more experienced programmers with knowledge of the state of the art platforms (mobile). - Graphics, arts and animation again across different games platforms.	*Shortage of appropriate employees* *Individual capabilities and knowledge*	*Understanding the nature of Knowledge management practices including knowledge sharing and transfer* *What tools are used for managing knowledge in the organisation?* *How is knowledge acquired/shared/transferred in the process of producing games*
Knowledge sharing	Knowledge sharing is critical within the organisation because of a lack of skills and training.	The main reasons cited for not sending staff on training courses were costs – the financial outlay for the training itself and also the fact that the companies could not afford their staff to "be away from work" since they were far "too busy". Other	*Individual Capabilities & Knowledge* *Shortage of appropriate employees*	

	Staff are not sent on training courses and it takes place onsite	reasons were a lack of training programmes for the skills required; having "no training requirements"; and also "hiring experienced staff for most suitable tasks".	*Knowledge sharing*	*software?*
Current and future games production	Average of 6 games per company per year	Primary role as developers Dual role of publisher and developer have higher than average turnovers	*Nature of production planning and control of projects*	*How are games produced? Probe for the process from generating the idea to final product; probe for the role of individuals and the role of knowledge in the production process*
Performance Measures	IP ownership Driven by licensed IP None of the IP owned by developers Resource Ownership e.g. 3D engines and graphics/ animation support tools	Sharing of equipment with close and 'trusted' partners/collaborators IP as a means of ensuring organisation is financial sustainable in the medium to long term	*IP as a measure of performance* *Knowledge sharing/ Collaboration*	*How is performance measured in the organisation?* *What is the innovation process in your organisation? How important is it? Can you give examples of innovation in your organisation? Probe for the role of knowledge in the innovation process* *Probe for importance of IP*
Initiatives & Support	Business support for strategic planning, sourcing/application for funding More informed approach to decision making and budget management Networking to keep in touch with industry and other developers Finance for IP & Prototype development		*Knowledge sharing (external) Collaborations* *IP as a measure for performance*	*How does knowledge sharing happen in your organisation?* *How is this process managed?*

Table 2. Summary of Interviewee Profiles

Company	**Company Type**	**Firm Size (No of employees)**	**Firm Structure**	**Interviewee Role**	**Background & Experience**
SE1 *	Game developer	16	Flat	CEO	Software development
ME2	Web developer	147	Hierarchy (Flat (team))	MD	Graphic design, programming, mobile games and product development
			Hierarchy Flat (team)	Technical Manager	Programming, and product development
ME3 **	TV Platform developers	140	Hierarchy	Project coordinator	Software development
			Flat (team)	Chief technical officer	
ME4	Children's Games	60	Flat (team)	Co-founder	No prior experience in the gaming sector
SE5	Game developer	16	Flat	Director and founder	Programming, creative directing, production and business development.
MiE6 ***	3D Animations	1	Flat	Owner	3D animations

					and graphic design
MiE7	Game developer	7	Flat	Co-founder	Publishing and business development in the gaming industry
ME8	TV Platform content developers	70	Flat (team)	Head of Marketing	Marketing
***(MiE) Micro enterprise < 10 employees *(SE) Small enterprise 10-49 employees **(ME) Medium enterprise 50-249 employees					

Table 3: SMEs knowledge sharing processes and impact

Company	Knowledge Sharing Process	Knowledge Sharing Tools	Knowledge /Information	Use of KS to enhance performance
SE1 (Game developer)	• Individual expertise and knowledge: NONE	• Tacit (face-to-face)	General company information Project management information Disseminating information to customers.	Ideation/Innovation Effective Operations: Production planning (project management) Control (version control, process control) Marketing and CRM Increase Sales
	• Sharing information externally with customers	• Social media: Facebook & Twitter		
	• Sharing information internally within company	JIRA and Intranet system Email, Skype, IM's		
ME2 (Web developer)	• Individual expertise and knowledge: NONE	• Tacit (face-to-face)	Project management information	Ideation/Innovation Effective Operations: Production
	• Individual expertise and	• Tacit (face-to-face)		

	knowledge: Including more than one person working on a project		General company information General industry knowledge (gained from external blogs, member fora)	planning (project management) Control (version control, process control) Marketing and CRM Increase Sales
	• Operations and project management (PM)	• PM software • Version control Database • Email, Skype, IM's, Google hangouts and Blogs, Google docs		
	• Marketing Campaigns	• Facebook twitter		
ME3 (TV platform developer)	• Individual Knowledge Management & expertise: move people around the organisation	• Tacit (face-to-face)	Project management information General company information	Ideation/Innovation Effective Operations: Production planning (project management) Control (version control, process control)
	• Operations and project management (PM)	• PM software • Version control Database • Email, Skype, IM's, Google docs, Wikis conference calls, social media e.g. Yammer		
ME4 (Children's Games)	• Individual expertise and knowledge: Including more than one person working on a project	• Tacit (face-to-face)	Projects status and reports, General company information Children/client database Marketing campaigns Customer support and	Ideation/Innovation Effective Operations: Production planning (project management) Control (version control, process control) Improve Marketing and CRM Increase Sales
	• Regular code reviews as documents get out of date frequently.	• Google documents, cloud storage		
	Operations and project management (PM)	PM software Version control Database		

		Email, Skype, IM's, Trello, Google hangouts, Google documents. Facebook and twitter.	engagement	
	• Product details for users	Twitter Facebook		
SE5 (Game developer)	• Operations and project management (PM) Standard operating procedures available	• Wiki	General company information, Project management Task management Customer support and engagement	Ideation/Innovation Effective Operations: Production planning (project management) Control (version control, process control) Improve Marketing and CRM Increase Sales
	• Individual expertise and knowledge: NONE	• Tacit		
	• Operations and project management (PM)	• Email, Skype		
	External Product updates/fan engagement/adverts	• Twitter, Facebook		
MiE6 (3D Animations)	• Individual expertise and knowledge: NONE	• Tacit	Project Management: Instructions/ information passed between clients/publishers	Ideation/Innovation Effective Operations: Production planning (project management) Control (version control, process control) Improve Marketing and CRM Increase Sales
	• Operations and project management (PM)	• CDs DVD's Blue Ray, Removable drive • Email, Skype		
	• User Updates	• Blogs, Twitter, Facebook		
MiE7 (Game developer)	• Individual expertise and knowledge: Including more than one person working on a project (cross functional roles)	• Tacit	Project Management General company information	Ideation/Innovation Effective Operations: Production planning (project management) Control (version control, process control) Improve Marketing and CRM Increase Sales
	• Operations and project management (PM)	• Tacit • Google analytics, email		
	• Processes are documented	• Cloud storage		
	• User Updates • Spooling data from Facebook ads	• Blogs, Facebook • Facebook ads		

ME8 (TV platform content developer)	• Individual expertise and knowledge: Including more than one person working on a project (collaborative roles)	• Tacit	General company information Project Management database	Ideation/Innovation Effective Operations: Production planning (project management) Control (version control, process control) Improve Marketing and CRM Increase Sales
	• Operations and project management (PM) Processes are documented	• Cloud storage, Wiki • Email, cloud		
	Marketing Campaigns	• Facebook twitter		

Figure 1. Production, planning and control process and related innovation phases and skills, adapted from Aoyama and Izushi (2003: 437)

Figure 2. A General Framework for Knowledge Sharing (adapted from Lin 2007)

Figure 3. Explanatory Mixed Methods Research Approach

Figure 4. A Model of Knowledge Sharing, and Innovation Performance in Micro/SMEs